GEORGIA INSTITUTE OF TECHNOLOGY — OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[x] ORIGINAL [ ] REVISION NO. _____

Project No. E-16-D04 DATE 10/5/82

Project Director: Don P. Giddens NIH School/Lab Aerospace Engineering

Sponsor: DHHS/PHS/National Heart, Lung, and Blood Institute

Type Agreement: Grant No. 5 R01 HL 22635-04

Award Period: From 7/1/82 To 6/30/83 (Performance) ----- (Reports)

Sponsor Amount: $110,190 Contracted through: GTRI/GIT

Cost Sharing: $5,799 (E-16-316)

Title: Hemodynamics of Normal and Diseased Caretid Arteries

ADMINISTRATIVE DATA

OCA Contact John W. Burdette

1) Sponsor Technical Contact:

Mr. Roger S. Powell
National Heart, Lung & Blood Institute
National Institute of Health
Bethesda, MD 20014
301-496-1586

2) Sponsor Admin/Contractual Matters:

Mrs. Lacey J. Burham
Grants Operations Branch
Division of Extramural Affairs
Nat'l Heart, Lung & Blood Institute
National Institute of Health
Bethesda, MD 20014
301-496-7255

Defense Priority Rating: N/A

Security Classification: N/A

RESTRICTIONS

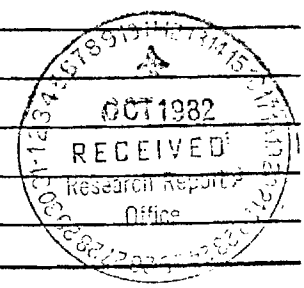
See Attached NIH Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with none proposed

COMMENTS:

Continuation of E-16-D03.



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GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date October 28, 1983

Project No. E-16-D04 School/~~XXX~~ Aerospace Engineering

Includes Subproject No.(s) _____

Project Director(s) Dr. P. Giddens ~~GTRI~~ / GIT

Sponsor DHES/PHS/National Heart, Lung and Blood Institute

Title Hemodynamics of Normal and Diseased Carotid Arteries

Effective Completion Date: 6/30/83 (Performance) _____ (Reports)

Grant/Contract Closeout Actions Remaining

- [X] None
- [ ] Final Invoice or Final Fiscal Report
- [ ] Closing Documents
- [ ] Final Report of Inventions
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other _____

Continues Project No. E-16-D03 Continued by Project No. E-16-D05

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PROGRESS REPORT

1. There has been no change in our scientific goals.

2. a. Two signal analysis techniques which are new to blood flow studies have been applied to poststenotic velocity measurements in the dog aorta. These are: (i) phase shift averaging (PSA) and (ii) autoregressive (AR) methods of spectrum estimation. The PSA technique is employed to reduce effects of physiologic, beat-to-beat variation in underlying velocity waveforms. The AR spectrum estimation method offers advantages over Fourier analysis when turbulence characteristics change during the heart cycle. We view these techniques as extremely important in the analysis of blood flow disturbances.

b. Our phase lock loop (PLL) method of converting the Doppler ultrasound signal to a fluid velocity measurement has been shown to be an accurate method for determining flow disturbances in cases of mild to moderate disease, but not for severe turbulence. We have begun analyzing data recorded from human carotid vessels, using PLL processing, and have employed a Dynamic Disturbance Index (DDI) to characterize the evolution of disturbances during the cycle. Results to data are encouraging, but numerous patients must be studied before we are able to place the technique on a basis which can quantitate the degree of stenosis.

c. Experiments have been performed in which laser Doppler anemometry was applied to the measurement of a pulsatile velocity field in the carotid artery model. These studies have very recently been compared with noninvasive Doppler ultrasound data in a young normal; and we have demonstrated that the peculiar flow signals found by ultrasound can be readily interpreted from the model results. We find no turbulence in the model bifurcation, but complex time-varying flow patterns exist. The outer wall of the carotid sinus, the site within the carotid bifurcation now known to be first affected by atherosclerotic lesions, experiences an oscillating shear field rather than one of continual low shear.

3. Specific Objectives for the Coming Year

a. The analysis of human carotid artery data will continue, using the PSA, DDI and AR analysis tools. We plan to attempt to relate flow disturbances to the level of disease.

b. In vitro studies will continue using a carotid artery model in which plaque development is simulated. These results will be employed to determine the variation of flow disturbances with disease development.

c. The AR and PSA methods will be employed to identify coherent and random flow structures as measured in vivo (noninvasively with pulsed Doppler ultrasound) and in vitro (with laser Doppler anemometry under carefully controlled experimental conditions).

4. Research Involving Human Subjects

a. There have been no change in the protocols involving human subjects since the last competitive review, nor do we anticipate any change for the coming year.

b. The protocols were evaluated and approved by our Human Subjects Committee at Georgia Tech.